

GOVERNMENT OF INDIA

Central Advisory Board of Health

REPORT

(1939)

OF

The Committee appointed by the Central Advisory Board of Health to investigate the question of food adulteration in India with particular reference to legislation now in force in different provinces and to the varying standards which are in force.



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Introduction.

1. This Committee was appointed by the Central Advisory Board of Health at its first meeting in June, 1937, in order to investigate the whole question of food adulteration in India with particular reference to legislation now in force in different provinces and to the varying standards which are in force. Certain difficulties were encountered which prevented the Committee from meeting during 1937 and 1938, and these were explained at the second meeting of the Board in January, 1939.

2. During the discussion which led to the appointment of this Committee, the Secretary of the Board emphasised the difficulties arising from the fact that different provinces have different standards for individual foodstuffs, especially in regard to ghee. These variations in standards were interfering with trade between provinces, a position which should not be allowed to continue or to develop. Since then circumstances have arisen which made it still more urgent to investigate these variations in standards in India especially on account of their increasing repercussions on inter-provincial commerce.

3. In 1937 the Agricultural Produce (Grading and Marking) Act was passed by the Central Legislature introducing what is known as the "AGMARK" scheme for the grading and marking of foodstuffs. Rules were published under that Act giving standards for a number of foodstuffs, including ghee. Since the provincial standards vary so much, these Agmark standards (for ghee and mustard oil) inevitably conflict with some provincial standards, and this has drawn further attention to the desirability of having uniform standards throughout India as far as possible.

Classification of the Problem.

4. In view of the technical nature of this question of standards the Chairman of the Central Advisory Board of Health decided that the technical members of the Food Adulteration Committee should be called together for a preliminary discussion on this particular aspect of the food adulteration problem. The technical members met on the 21st, 22nd and 23rd of July 1939. An early general review of the question of food adulteration led the members to consider that the subject can be divided into three parts :

- (1) the technical aspect comprising
 - (a) standards for purity in regard to different foods,
 - (b) the standardisation of the technique employed in food analysis, including methods of sampling, methods of testing in the laboratory, standardisation of apparatus used, etc. ;
- (2) the legislative aspect, including an examination of the various Acts and Regulations in the provinces and the making of suggestions for their improvement in order to make the law more effective ; and
- (3) the administrative aspect, which includes the staff to be employed, their qualifications, methods of sampling, laboratory accommodation and its location, etc.

5. The time of the technical members was fully occupied, during the three days on which they met, in discussing the technical problems of food analysis. On the 28th and 29th of September a full meeting of the Food Adulteration Committee was held to consider the results of the preliminary discussions of the technical members and as a result the following report and recommendations are presented to the Central Advisory Board of Health.

6. As will be clear from the foregoing, this report does not cover the whole question of food adulteration ; limited time and staff have confined its scope to the

technical aspect of the question. The whole problem of food adulteration is so wide and far-reaching that the Committee believe that it will be to the advantage of Governments to consider their recommendations in parts. While, therefore, this report, as explained, deals only with the technical aspect, the study of the legislative and administrative aspects of the question will continue to be pursued by the Committee; and it is proposed that further reports on these parts of the question should be presented at subsequent meetings of the Central Advisory Board of Health.

Present Practice in India and in England.

7. For many years the notification of standards of purity in foodstuffs in India has been the responsibility of Provincial Governments. The practice has been as follows: In almost every province a Food Adulteration Act has been passed which permits the Provincial Government to frame rules for the administration of the Act. Under these rules, and sometimes also in the main Act, standards of purity are prescribed for different articles of food, and when a sample of food fails to conform to a prescribed standard, it is presumed, until the contrary is proved, that the sample is not genuine.

8. This practice differs from that obtaining in England where it can be said the control of food adulteration is probably exercised as efficiently as in any other country. In England the practice of fixing standards is followed to a limited degree and applies in regard to the following articles:—

Milk (presumptive standard).

Condensed and dried milk products (absolute standard).

Butter (absolute standard).

Margarine (absolute standard).

For other articles of food, the public analyst in England is not bound rigidly by standards but is allowed to use his judgment, which he is expected to form in the light of the experience of a number of tests and taking into account certain local conditions. Uniformity of practice among the different Public Analysts is assured by the cooperation of the Government Laboratory, Ministry of Health and the Society of Public Analysts. The cooperative work of the Society of Public Analysts is recognised by the Government Departments concerned, and that Society is entrusted with the task of issuing instructions to its members regarding methods of analysis and the interpretation of results. Sub-committees of the Society are constantly studying the various and changing problems in regard to food adulteration which result from new methods of manufacture, the discovery of new food substitutes, etc.

9. There is, therefore, in England an effective coordinating body at the centre. On the other hand, in India the Provincial standards have been fixed by individual Provincial Governments with but limited consultation with one another. The question of food standards is one which is constantly changing. New methods of sophistication and new methods of detection are being discovered from day to day, and for that reason the Committee, at an early stage in their deliberations, were convinced that an effective method of coordination between the Provinces in regard to this important subject is an urgent necessity.

10. While impressed with the information supplied regarding the practice followed in England and its smooth and effective working, the Committee considered that for some time to come it will not be possible to follow closely the British practice. In that country magistrates are generally prepared to accept the evidence of a Public Analyst in regard to the presence of adulteration in an article of food. In parts of India the magistrates are disinclined to adopt such an attitude. Speaking generally, therefore, the Committee are of opinion that in India for some time to come it is desirable to have standards prescribed for as many articles of food as possible in order to meet the present situation.

11. The correct outlook on this question of fixed standards is described by Lt.-Col. A. D. Stewart, I.M.S., in a preface to a Memoir by Dr. B. B. Brahmachari on the analysis of mustard oil. The Committee endorse Lt.-Col. Stewart's views when he says:

"The ordinary British Food and Drugs Acts are purposely indefinite; save in a few instances, such as milk and some milk products, no limiting standards for purity are declared. The experience and skill of the public analyst, the sense of

justice and equity of judges and magistrates are relied on to protect the public interest. The analyst must state that the article sold was or was not sold to the prejudice of the purchaser and also the nature and percentages of the adulterating ingredients. In India, however, when Food Adulteration Acts were first worked, magistrates and judges had little or no experience of such laws and there were not perhaps at that time a sufficient number of chemists available with the high attainments of the English public analyst. For these reasons something more definite was aimed at in the Indian Food Adulteration Acts, and limiting standards have in most provinces been laid down; and speaking generally foodstuffs which on analysis give results within the standard limits are passed as genuine, those outside the standards being reported as adulterated. Nature, however, does not distribute her samples within strict limits but usually in a normal or "Gaussian" curve of chance distribution; and the distribution of a particular constant of one article may (and does) overlap the distribution of another. A range of a particular constant of a commodity will therefore tend to exclude genuine samples of its own kind, while it may easily include mixtures with closely allied neighbours. Moreover, different provinces may choose to select different ranges of standards for the same article. A feeling of uncertainty and confusion may confront the analyst and the purpose of the laws tend to be foiled.

"There will thus ensue a tendency on the part of the analyst in Indian provinces to get away from the standards of ranges of constants to more precise methods. He will rather seek for definite characteristics of the foodstuffs under consideration and for definite evidence of particular adulteration, the standards of constants being used as corroborations. This tendency is thus towards British methods."

Appointment of Central Committee for Food Standards.

12. The Committee would like strongly to emphasise that the improvement of methods of food analysis and the prevention of food adulteration in India will have to be a continuous process. The establishment of coordination is second to none in urgency and it is, therefore, recommended that immediate steps should be taken by the Government of India or by the Central Advisory Board of Health to set up a Standing Central Committee which will act in an advisory capacity on the lines of the Society of Public Analysts in England and the British Standards Institution. It might be called "The Indian Central Committee for Food Standards". The expert technical advice of this Committee will be of the greatest value to Provincial Governments desiring to develop and improve their existing organisation for the detection of food adulteration. There are no articles more liable to adulteration in this country than milk products, and the Committee therefore consider that a suitable Central Committee can be formed by including in it representatives of dairying and agricultural research, public analysts and other persons experienced in food analysis. A committee of about seven members is regarded as adequate. The Public Health Commissioner with the Government of India could act as Chairman.

13. An early task of this Committee would be the preparation of a set of "Instructions for Public Analysts". These instructions should be modified and supplemented from time to time in the light of new knowledge. In this way a large step will be taken towards breaking down the inter-provincial barriers which, as already explained, now constitute a definite obstacle to free inter-provincial commerce in certain foodstuffs.

14. The Committee was impressed by the evidence placed before it of the variations in analytical results which occur throughout different parts of India in regard to genuine articles of food. These variations arise from a variety of conditions, such as climate, breed of animal, methods of feeding, methods of cultivation and methods of manufacture, etc. Much more information on these various points is required in order efficiently to coordinate provincial practice and this will require not only a continuous critical analysis of the various results obtained by public analysts in their routine work, but, in addition, organised research into certain problems. The proposed Central Committee will be in the best position to advise on the planning and execution of such research.

Extent to which adulteration is practised.

15. The following table shows the total number of samples of foodstuffs examined in the different Provinces in the year 1937.

Percentages of adulteration of articles of food sampled in the provinces in 1937.

Province.	Total Number of samples examined.	Percentage adulterated.	Percentage of samples of milk and milk products among total samples.	Percentage adulterated.	Percentage of samples of edible oils among total samples.	Percentage adulterated.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. N.-W. F. Province ..	185	43.8	100.0	43.8	Nil.	Nil.
2. The Punjab* ..	805	68.3	96.6	70.5	1.0	Nil.
3. Delhi ..	250	68.0	100.0	58.0	Nil.	Nil.
4. The United Provinces ..	10,132	22.0	75.6	23.3	14.1	20.4
5. Bihar ..	1,545	36.1	47.4	53.5	34.1	13.9
6. Bengal† ..	8,110	26.2	23.2	46.4	71.3	21.1
7. Assam ..	465	31.8	68.4	43.7	15.9	5.4
8. Orissa ..	267	69.7	67.0	79.9	19.1	39.2
9. The Central Provinces ..	53	37.7	37.7	100.0	Nil.	Nil.
10. Madras‡ ..	7,072	39.7	73.8	44.5	15.7	13.0
11. Bombay ..	12,404	10.3	90.4	21.0	0.04	80.0
12. Sind ..	3,857	22.7	25.7	15.9	1.6	19.7
Total samples ..	46,105	26.7	65.4	30.9	19.9	19.4

* The figures relate only to the samples examined at the Public Health Chemical Laboratory.

† The figures relate only to the Bengal Public Health Laboratory at Calcutta.

‡ The figures relate to 1937-38.

16. It will be seen that the percentage of adulteration is extremely high. The corresponding figure in England for the percentage of samples adulterated is about 5 per cent. The principal articles which are found to be adulterated in India are milk products and edible oils, conditions varying in different parts of the country. For example, in the N.-W. F. Province, Punjab, Delhi, United Provinces, Assam, Orissa, Madras and Bombay milk and milk products are the main concern of the public health authorities in their attempts to prevent adulteration. On the other hand, in Bengal, edible oils (mustard oil) have claimed much the largest share of attention. In Madras, Orissa, Bengal, Bihar and the United Provinces, edible oils such as mustard oil, sesame oil, etc., are subject to wide adulteration. It should be pointed out, however, that the figures in the table should not be taken altogether at their face value. In the Punjab it is reported that a frequent practice is to carry out a local preliminary examination of samples, and it is only when this preliminary examination indicates the possibility of adulteration that the rest of the sample is sent to the public analyst. In other parts of the country also samples are drawn on receipt of complaints. To a certain extent therefore the samples must be regarded as selected and not taken at random. Nevertheless, it can be taken for granted that not only is adulteration widespread throughout the country but the degree to which it is practised is extremely high.

17. The Committee had before them a statement showing the standard at present prescribed in the various Provinces for different articles of food. These are reproduced as an Appendix.

Milk.

18. Existing provincial standards for cow, buffalo and mixed milk are given on pages 18, 19 and 20 of this report. It will be seen that the minimum percentage

of milk fat in cow milk is the same in 8 out of the 10 provinces. In these 8 provinces the figure is 3·5 per cent., the remaining 2 (Madras and the Central Provinces) having a figure of 3·0 per cent. In respect of solids not fat, for cow milk the figure is 8·5 in all provinces except in the N.-W. F. Province which has a percentage of 8·0.

19. As regards buffalo milk, the standard for milk fat is 5·0—6·0 everywhere except in Madras which has a figure of 4·5 per cent. The standard for solids not fat is 9·0 per cent. in all provinces except the Central Provinces which has prescribed 8·5 per cent.

20. In regard to the fat content of cow and buffalo milk, the Committee consider that it is not advisable to recommend an all-India figure. It should be left to the provinces to decide the figure for themselves. In arriving at this conclusion the Committee took into consideration the fact that practically no inter-provincial trade in liquid milk exists and that the formulation of a common all-India standard is not therefore imperative. Further, the Committee understand that in Madras the milk fat standards of 3·0 per cent. for cow milk and 4·5 per cent. for buffalo milk were fixed after a large number of genuine milk samples from cows and buffaloes had been examined. It is not known whether similar preliminary investigations were carried out in the Central Provinces when a figure of 3·0 per cent. was fixed for milk fat in cow milk.

21. With regard to the solids not fat, the Committee are not aware of any particular reasons which induced the N.-W. F. Province to fix their figure at 8·0 per cent. for cow milk. They recommend that, except there is some strong reason to the contrary, this figure should be raised to 8·5 per cent. With a similar qualification the Central Provinces Government ought to raise their figure of 8·5 per cent. for buffalo milk to 9·0 per cent.

22. On page 20 of this report it will be seen that a certain number of provinces has prescribed separate standards for mixed (cow and buffalo) milk. There is no doubt that the fewer standards there are the simpler will be the task of administration and it has been stated that three standards laid down in some Provinces for cow, buffalo and mixed milk lead to considerable difficulties in the detection and prevention of adulteration.

23. The Committee consider that it is not desirable to prescribe a separate intermediate standard for mixed milk, largely on account of its varying composition depending upon the proportion of cow and buffalo milk present in the mixture. They recommend that the practice of the Madras Government should be followed. In the Madras rules it is stated "where milk is sold without any indication as to whether it is derived from cow or buffalo, the standard of cow milk shall apply."

24. In England, in addition to certain presumptive standards (3·0 per cent. milk fat and 8·5 non-fatty solids), the law lays down a definition of milk. The Committee consider this to be a desirable practice and recommend the following as a suitable definition:

"Milk is the normal, clean and fresh secretion obtained by complete milking of the udder of the healthy cow or buffalo or both during the period following at least 72 hours after calving or until colostrum free, whether such secretion has been processed or not."

The Committee's object in including the qualification regarding processing of milk is to ensure that pasteurised and boiled milk come within the range of operation of the Act.

Ghee.

25. This subject presented a difficult problem to the Committee. Ghee is an almost indispensable article of diet in North-Western India, while in other parts of the country its use in the Indian home is not inconsiderable. Inter-provincial trade in ghee exists on a large scale and, as has been pointed out earlier in this report, the variations between provincial standards have reacted unfavourably on the free flow of trade in this commodity, while the new Agmark standard has added a further complication. An essential step towards relieving the situation is an agreement between the Provinces as to what will be accepted as genuine ghee.

26. Existing provincial standards for cow, buffalo and mixed ghee are shown on pages 21, 22 and 23 of this report. In respect of each class of ghee the Provinces

present variations in respect of the number of standards. The two extremes are represented by the Madras and Agmark standards. Madras has prescribed only one standard, namely the maximum percentage for moisture, while the Agmark standards prescribe figures for seven different tests.

27. The formulation of a uniform standard applicable all over the country presents certain difficulties. In the first place, the agricultural marketing authorities of the Government of India assert that genuine samples of ghee from certain parts of India, such as Kathiawar, Coimbatore and Guntur, give a Reichert and other values which are markedly different from those obtained with samples from Northern India generally. The tables on pages 21 and 22 of this report show that the minimum Reichert values prescribed by Provincial Governments in Northern India are 24 for cow ghee and 30 for buffalo ghee. The marketing authorities state that genuine buffalo ghee from Kathiawar may give a figure even as low as 19. The annual report of the Government Analyst, Madras, for 1937-38 shows that in that Province 153 samples giving Reichert values below 24 were passed as genuine. On the other hand, 45 samples having a Reichert value of over 24 were condemned as adulterated, in every case the nature of the adulterant being identified without any possibility of doubt.

28. The Committee's discussions revealed that, in certain Provinces, by reason of certain presumptive standards provided in the Act or Rules, public analysts may feel compelled to apply them rigidly, a sample being condemned when it fails to pass any one of the prescribed tests. In this they may be justified legally since it is clearly provided that a sample of ghee must conform to certain presumptive standards. On the other hand, in certain other Provinces, the analysts regard the figures more as a guide to help them in forming their judgment about the sample in question, and a verdict of adulteration is given on a consideration of the results of all tests taken together. The latter is in accordance with the practice in England.

29. Taking into consideration the foregoing facts, the Committee came to the conclusion that the values, in respect of ghee (and of some other articles of food to be mentioned later) should not be regarded as arbitrary figures which of themselves decide whether a sample is adulterated. The Committee consider that a public analyst ought not to act as an automaton condemning samples below a certain line and passing samples above it. Their view is that a certain measure of freedom to base his judgment on the results of all possible tests is essential for an analyst. There is an interdependence between the values resulting from different tests. In arriving at his conclusions regarding a sample, an analyst should bear this in mind and, except of course in a flagrant case of adulteration, be guided by the general picture presented by the results of his various tests. Further, while it is possible with a considerable degree of precision by means of the phytosteryl acetate test, to prove the adulteration of ghee with vegetable fat, in respect of animal fat the methods of analysis available are not so satisfactory. Admixture with animal fat will reduce the Reichert value of ghee and will at the same time disturb the values of certain other tests. Nevertheless, adulteration to a certain extent may still go undetected. The foregoing facts emphasise the importance of recognising the values for individual tests as being no more than guides for the analyst in forming his opinion regarding the sample under investigation. The proposed Central Committee for Food Standards can exercise a strong influence towards evolving truer criteria of analysis by making available to public analysts new knowledge regarding methods of analysis, and by formulating fresh methods in order to meet new situations as they arise.

30. Some provinces have at present separate standards for cow, buffalo and mixed ghee. Buffalo ghee has usually a markedly higher Reichert value than cow ghee and the figure for mixed ghee will naturally be determined by the proportions of cow and buffalo ghee present in the mixture. For administrative purposes, a single standard for all classes of ghee is obviously an advantage. It would also facilitate smooth inter-provincial trade. The Committee, however, consider that to fix a single standard for the three classes of ghee will leave a loophole for adulteration to the prejudice of the consumer. They, therefore, are of

opinion that separate working standards should be adopted. The standards recommended are as follows:—

Butyro-refractometer reading at 40°C.	<i>Cow Ghee.</i> 40·5-42·5	<i>Buffalo Ghee.</i> 40·5-42·5	<i>Mixed Ghee.</i> 40·5-42·5
Moisture content%	Not more than 0·5	Not more than 0·5	Not more than 0·5.
Saponification value	222-226	226-234	222-234
Reichert value	Not less than 24	Not less than 30	Not less than 28.

31. The four constants butyro-refractometer reading at 40°C., percentage of moisture content, saponification value and Reichert value are sufficient as routine tests. When as a result of these tests the analyst's suspicion is aroused in regard to adulteration, he ought to undertake further tests like the phytosteryl acetate test and those for the Polenske and Kirschner values. In regard to free fatty acid calculated as oleic acid, the Committee consider that, though excessive acidity does not constitute adulteration, it indicates low quality. Another question is that of rancidity, and the Committee recommend that the questions of rancidity and acidity in respect of ghee and of edible oils should be investigated by the proposed Central Committee on Food Standards. At present our knowledge on these points is limited.

32. It is again emphasised that the standards recommended are a guide, and the figures in no way imply that all samples of ghee giving a higher figure than this should automatically be regarded as unadulterated.

33. To sum up, in so far as specific tests can demonstrate unmistakable evidence of adulteration of vegetable or animal origin, the analyst is justified in condemning the sample irrespective of the fact that it conforms to the values recommended in regard to other tests. The Committee are strengthened in their recommendation by the consideration that the proposed Central Committee for Food Standards may be expected to revise the standards now recommended in the light of further information, when it becomes available, and to bring to the notice of public analysts any new tests that may be developed in India or in other countries for improving efficiency in the detection of adulteration. The Committee again wish to emphasise that the efficient control of food adulteration can be achieved in this country, only as a measure of progressive development both in the sphere of improvement of the technical aspects of the problem as well as of its administrative aspects. Further investigation is required regarding the methods of adulteration now in common use. More knowledge is required in respect of the characteristics of genuine ghee in different parts of India depending on factors such as breed of animal, method of feeding, seasonal and climatic conditions, etc. It will be the task of the Central Committee to collect such information and as a result to offer suitable guidance to Provincial Governments.

34. In regard to the special areas such as Kathiawar, Coimbatore and Guntur, in which according to the marketing authorities of the Government of India genuine samples of ghee give a Reichert and other values markedly different from the figures recommended in this report, the Committee consider that the Central Committee for Food Standards should as soon as possible advise on appropriate standards for such ghee. Some system of marking or labelling will be required so that health authorities, analysts and the public can recognise the origin of such ghee. To avoid any chance of substitution or adulteration special arrangements will have to be made to ensure efficient supervision and control at the place of production.

35. As in the case of milk, the Committee consider it desirable that Provincial Regulations should contain a definition of ghee, and the following definition is recommended:—

“Ghee means ghee prepared exclusively from the pure clarified milk fat of the cow or buffalo or both.”

Edible Oils.

36. The edible oils used in India are numerous. For instance, under the rules framed for the prevention of food adulteration by the Government of Sind, which are among the latest published by Provincial Governments, edible oils have been defined as meaning almond oil, groundnut oil, coconut oil, mustard oil, cotton

seed oil, linseed oil, niger seed oil, olive oil, poppy seed oil, rape oil, soya bean oil, safflower oil, til oil (sesame or gingelly) and sunflower oil. Of these oils only a few are used over large parts of the country, these being mustard oil, groundnut oil and til oil. Mustard oil is largely used in the Provinces of Northern India, its use progressively diminishing from east to west. On the other hand, groundnut and til oils are used extensively in South India, particularly in Madras Presidency and til oil in Central and Western India. The other oils are used in more limited areas in different parts of the country.

MUSTARD OIL.

37. The standards prescribed by Provincial Governments for mustard oil are shown on page 28 of this report while the draft Agmark standards are shown on page 29. As may be seen from the description given for mustard oil on page 29, the ordinary products on the market is obtained from the mixed seeds of a group of allied plants. It was brought to the notice of the Committee that the identification of these plants is not free from confusion, that a committee of economic botanists have been engaged for some time on their study at the Imperial Agricultural Research Institute, Delhi, and that, in this connection, they are preparing a whole series of demonstration plants. The oils obtained from the seeds of these different plants yield different values for certain of the tests prescribed, as may be seen from the saponification and iodine values set out on page 28 of this report under the standards in force in the Punjab. Varying proportions of such seeds in the manufacture of mustard oil result therefore in producing oils which differ from one another in respect of the values for specific tests. For instance, the Committee were informed that oil from the *rai* seed can give iodine values as high as 116 and that the area of cultivation of this plant in the United Provinces is extending. The increasing admixture of *rai* seeds with mustard seeds would therefore tend to raise the iodine value of mustard oil produced in the United Provinces to a higher level than those shown by the provincial figures on page 28. This and the fact that distinguished botanists are not yet agreed on the particular species of plants which should be included in the mustard family show that the fixing of rigid standards is not desirable.

38. The Committee therefore consider that, as in the case of ghee, standards for mustard oil should serve only as a guide to public analysts and not as rigid values which would, of themselves, determine the purity of the samples under examination. The standards that the Committee recommend are:—

<i>Butyro-refractometer reading at 40°C.</i>	<i>Saponification value.</i>	<i>Iodine value. (Wij's method).</i>
58—60	169—176	96—106

As several methods are available for estimating the iodine value, the Committee recommend that Wij's method should be adopted. In regard to the definition of mustard oil, the Committee consider that until after the work of the Committee of economic botanists has made available more information on the subject, it is not possible or desirable to make a suitable recommendation in this respect.

39. In regard to rancidity and acidity in mustard oil, the Committee consider that information on these points is limited and that the proposed Central Committee for Food Standards should make investigations on the subject.

OTHER EDIBLE OILS.

40. In regard to the other edible oils the discussions of the Committee raised no important points in respect of variations in the provincial standards. In the opinion of the Committee the following standards would be suitable guides for all-India purposes.

Name of the edible oil.	Definition.	Butyro-refractometer reading at 40°C.	Saponification value.	Iodine value (Wij's method).
1. Groundnut oil ..	The oil obtained by a process of expression (not extraction) from the groundnut (<i>Arachis hypogaea</i>) and free from admixture with other oils or any other substances.	55—57	188—196	85—99

Name of the edible oil.	Definition.	Butyro-refractometer reading at 40°C.	Saponification value.	Iodine value (Wij's method).
2. Til, gingelly or sesame oil.	The oil obtained by a process of expression (not extraction) from til or gingelly (<i>Sesamum indicum</i>) seed (black, brown, white or mixed) and shall be free from admixture with other oils or any other substances.	58—61	188—193	105—114
3. Cotton seed oil ..	The oil obtained by a process of expression (not extraction) from the seeds of the cultivated species of <i>Gossypium</i> and free from admixture with other oils or any other substances.	58—59	190—195	110—116
4. Olive oil ..	The oil obtained by a process of expression (not extraction) from the ripe fruit, <i>Olea europaea</i> , and free from admixture with other oils or any other substances.	52—56	185—196	79—90
5. Poppy seed oil ..	The oil obtained by a process of expression (not extraction) from the poppy seed (<i>Papaver somniferum</i>) and free from admixture with other oils or any other substances.	60—64	186—194	133—143
6. Coconut oil ..	The oil obtained by a process of expression (not extraction) from the nut kernel of <i>Cocos nucifera</i> , and free from admixture with other oils or any other substances.	33.5—35.5	250—260	8—9
7. Linseed oil ..	The oil obtained by a process of expression (not extraction) from the seeds of <i>Linum usitatissimum</i> , and free from admixture with other oils or any other substances.	71.5—79	189—195	170—200
8. Safflower oil ..	The oil obtained by a process of expression (not extraction) from the seeds of <i>Carthamus tinctorius</i> , and free from admixture with other oils or any other substances.	62.4—64.7	185.5—186.0	135.2—135.6

Butter.

41. Provincial standards for butter are shown on pages 24 and 25 of this report. In respect of the butyro-refractometer reading at 40°C., saponification value and Reichert value of butter fat the Committee recommend that the standards prescribed as a guide in the case of ghee should apply. As regards maximum moisture content, all provinces except Assam, Bengal and Madras have prescribed a figure of 16 per cent., while these three Provinces have a figure of 20 per cent. The Committee were informed that, in Bengal, there are special reasons for this higher figure for moisture content in the case of home-made (*deshi*) butter. The Committee agreed that the all-India standard should be 16 which is a statutory standard and not a guide. In the three Provinces of Madras, Bengal and Assam the authorities, while possibly retaining 20 per cent. as the figure for maximum moisture content for home-made (*deshi*) butter, should consider the advisability of having 16 per cent. at any rate for butter not manufactured in the usual indigenous way.

42. The Committee recommend the following definition for butter :—

“ Butter means butter prepared exclusively from the milk or cream of the cow, or buffalo, or both, with or without the addition of salt, or of innocuous colouring matter.”

Other Milk Products.

43. Other milk products considered by the Committee are condensed milk, dried milk, skimmed or separated milk, skimmed milk reconstituted from skimmed milk powder in accordance with the instructions on the label of the container,

butter-milk, *dahi*, *khoa* and *chhanna*. In regard to these substances the discussions revealed no points of controversial importance. The standards recommended by the Committee are given below :—

CONDENSED MILK (ABSOLUTE STANDARD).

		Minimum per- centage of fat.	Minimum percent- age of milk solids including fat.
1. Condensed milk, full cream sweetened	..	9.0	31.0
2. Condensed milk, full cream, unsweetened	..	9.0	31.0
3. Condensed milk, skimmed, sweetened	..	..	26.0
4. Condensed milk, skimmed, unsweetened	..	..	20.0

DRIED MILK (ABSOLUTE STANDARD).

				Minimum percentage of milk fat.
1. Dried milk, full cream	..	..	..	26.0
2. Dried milk, three-quarters cream	..	..	..	20.0
3. Dried milk, half cream	..	..	..	14.0
4. Dried milk, one quarter cream	..	..	..	8.0

SKIMMED MILK (ABSOLUTE STANDARD).

				Minimum percentage of milk solids, other than milk fat.
1. Skimmed or separated milk	..	..	..	8.7
2. Skimmed milk reconstituted from skimmed milk powder in accordance with the instructions on the label of the container	..	..	..	8.7
3. Butter-milk	..	..	..	8.7

DAHI.

There is practically no interprovincial trade in *dahi* and the Committee do not feel called on to suggest any changes in the existing provincial standards which are as follows :—

Prescribing authority.				Minimum percentage of milk fat in dahi from—	
				Cow milk.	Buffalo milk.
U. P. Government	..	..	..	3.5	3.5
Bengal Government	..	..	..	3.5	6.0
C. P. Government	..	..	..	3.0	5.0
Bombay Government	..	..	..	3.5	6.0
Sind Government	..	..	..	3.5	6.0

Logically speaking, a Province's standards for milk fat in *dahi* should correspond to the figures prescribed in that Province for milk fat in cow milk and in buffalo milk.

KHOA.

The Committee recommend the following definition :—

“ *Khoa* is milk derived from cows or buffaloes, part of the water of which has been removed by heating, and it shall not contain any ingredient not found in milk.”

In regard to the standards for *khoa* the Committee consider that more information is necessary before all-India standards for maximum percentage of moisture and minimum percentage of fat can be recommended, and that the matter should be referred to the Central Committee on Food Standards when it is appointed.

Chhanna.

This milk product is mainly used in Bengal and the Committee recommend the adoption of the standards prescribed by the Bengal Government.

The Committee recommend the following definition :—

“ Chhanna is the product obtained by precipitating curd from boiling milk by the addition of lactic acid”.

Minimum percentage of milk fat	10.0
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Tea.

44. Provincial standards for tea are shown on page 33 of this report. The Committee consider that these figures should, as in the case of ghee and mustard oil, only form a guide to the public analyst in forming his judgment regarding adulteration in respect of the sample under examination. Even when a sample conforms to these standards, the presence of foreign leaves in the sample will condemn it as adulterated.

45. The Indian Tea Market Expansion Board have suggested the raising of tea standards in the various Provinces to those prescribed by the Government of Assam, and this would form a suitable subject for early enquiry by the proposed Central Committee for Food Standards.

Coffee.

46. Standards prescribed by Provincial Governments are given on page 34 of this report. The Committee consider that it is sufficient to define coffee and to suggest figures for standards so that they may serve as a guide to the analyst.

47. The following definitions for raw, roasted and ground coffee and standards for pure ground coffee have been suggested by the Agricultural Marketing Adviser to the Government of India :—

(a) Coffee shall be the seed of cultivated varieties of Coffee Arabica, Coffee Robusta and Coffee Liberica.

(b) Green, raw or unroasted coffee shall be coffee seed free from all but a small portion of its spermoderm.

(c) Roasted coffee shall be properly cleaned green coffee seed which by the action of heat (roasting) has become brown and has developed its characteristic aroma and shall not contain any admixture of substances other than coffee.

(d) Ground coffee shall be ' roasted ' coffee seed ground to a granular powder.

Standards for pure ground coffee: “ The nitrogen content shall not be less than 2 or more than 2.75 per cent. The ash content shall be between 3 and 5 per cent. and the ash shall be feathery, bluish white in colour and entirely soluble in dilute hydrochloric acid. The moisture content shall not exceed 1 per cent.”

The Committee recommend that the proposed Central Committee should make an early study of these suggestions and of the provincial standards with a view to recommending a common definition and standard for India.

Maida and Atta.

48. On page 32 of this report are given the provincial standards for *maida* and *atta*. The Committee consider the following definitions to be suitable :—

“ *Maida* is the fine product made by milling or grinding wheat and bolting or dressing the resulting wheat meal.”

“ *Atta* is the coarse product obtained by milling or grinding wheat and sieving it.”

49. In regard to the standards, the Committee consider that they should be used only as a guide. The following figures are recommended :—

<i>Maximum percentage of ash calculated on the dried substance.</i>	<i>Minimum percentage of gluten.</i>
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Maida.	Atta.	Maida.	Atta.
1.0	2.75	8.0	8.0

The percentage of crude fibre which should be permissible in these articles of food should be examined by the proposed Central Committee.

Vinegar and Malt Vinegar.

50. These, the Committee consider, should be referred to the Central Committee for Food Standards when it is established.

Edible Hydrogenated Vegetable Oil.

51. The Committee consider that the following is a suitable definition for this article of food which is commonly known as vanaspati :—

“ Edible hydrogenated vegetable oil (vanaspati) means and includes any article of food resembling ghee and consisting of refined hydrogenated edible vegetable oils, but which is entirely free from ghee, butter fat or any product derived from milk or other animal fat.”

Maximum acidity	0.25 per cent. calculated as oleic acid.
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Colouring of Vanaspati.

52. The question of colouring vanaspati in such a manner that ghee adulterated with this substance can easily be detected by the purchaser has in the past engaged the attention of the Central and Provincial Legislatures and of those engaged in the ghee trade. Some of the requirements for a suitable colouring agent are that it should be innocuous from the point of view of health, that it should not be bleached during the process of hydrogenation and that the colour imparted to vanaspati should be inviting in appearance. About a hundred different aniline dyes, which are non-poisonous, are available for colouration, but the difficulty is to select a colour which will differentiate vanaspati from ghee and will, at the same time, make vanaspati look attractive as a food product. Cow ghee has a yellowish colour and vanaspati coloured yellow to brown, when used as an adulterant of ghee, can produce a mixture closely resembling cow ghee in appearance. On the other hand, colours such as green or blue are unsuitable because they might convey the impression of the substance being poisonous. The question of colouration requires careful study and this is a suitable subject for investigation by the Central Committee on Food Standards.

Importance of Standardisation of the Methods of Analysis of Foodstuffs.

53. In the earlier part of this report the technical aspect of food adulteration has been divided into two parts, the second being : “ The standardisation of the technique employed in food analysis, including methods of testing in the laboratory, standardisation of apparatus used, etc.” The Committee wish to stress the importance of standardising the methods of analysis of foodstuffs. Standardisation of analytical methods is the basis underlying the principle of setting standards of composition for foods, and the only way to guarantee that different analysts obtain comparable results in the analysis of the same foodstuffs. Most of these methods are already standardised. It remains to introduce them officially into Indian practice.

54. All analytical chemists realise the difference between *absolute* and *empirical* methods of chemical analysis. In absolute methods, the chemist either weighs, or measures by volume, the absolute quantity of material used for reacting with, or a derivative formed from, the item to be analysed without interference from other constituents of a mixture. The results are accurately reproducible. In empirical methods, a certain strict adherence to a fixed routine associated with temperature, time, strength of reagents, dimensions of glassware, etc., has to be observed before reproducible results or results comparable with those of other workers can be obtained. In absolute methods the analyst has all the absolute standards of physics and chemistry at his command whilst in empirical methods,

he has not an accurate knowledge of the composition and behaviour of a heterogeneous mixture, the personal factor in the processes comes into play and he has not the means to assess accurately the experimental error in the analytical process involved. He is further at the mercy of factors over which he has no personal control, namely, the skill and accuracy of description of the analyst who initially devised the process and the accuracy with which the makers of equipment have made glassware to certain specified dimensions, graduation, pore size in filtering material, etc. It is obvious, therefore, that for individual analysts to obtain the same results in an empirical process of analysis, they must work to a standard technique with standardised apparatus. This is the value and object of standardisation.

55. The full scope of standardisation of empirical analytical methods embraces the operations of (a) sampling, (b) treatment of sample, (c) the processes of analyses, and (d) the interpretation of results. These will be dealt with briefly.

(a) *Sampling*.—Foodstuffs are of a heterogeneous nature and are subject to variation in composition either from batch to batch, settling into layers due to gravity, difference of moisture content due to humidity variations, etc. The value of standardisation of sampling methods is at once evident. Sampling may be said to be an operation in which the analyst is least satisfied. It is all the more so when the analyst has to accept the samples procured by other individuals, over whose sampling methods he has no control. Sampling can be treated theoretically on a statistical basis, and accuracy and standardisation of sampling must satisfy such statistical data. It is sufficient, however, in practice to determine (a) how many units per consignment must be selected at random for sampling, (b) what weight to take as a sample from each unit and (c) amount of final sample to be taken for analysis. The methods used can be exemplified by the published methods of the British Standards Institution or the sampling of coal, coal tar, dairy products, etc., which can be accepted as a working basis.

(b) *Treatment of sample*.—Since the amount of reaction in some analytical processes depends on the area of surface exposed, the particle size of the material analysed has to be decided by specifying a degree of fineness of grinding, usually by stating that the sample must be ground to such fineness as to pass through a sieve of predetermined size of holes. The method of mixing liquids of heterogeneous composition or those which like cream, stratify or precipitate on standing will also have to be described.

(c) *Process of analysis*.—It is necessary to standardise strengths of reagents, purity and (in some cases) physical constants of reagents (boiling point range and specific gravity for solvents), dimensions of apparatus, temperature conditions, rates of distillation, etc., in empirical analytical processes. Most processes connected with food analysis have already been laid down by various standardising bodies. Standard methods will have to be agreed on and their applicability to Indian conditions investigated. Each process will have to be studied individually and, if necessary, some cooperative work could be done to place the process on a satisfactory working basis. Special apparatus made to specification should be accompanied either by the certificate of a recognised standardising body (e.g., the National Physical Laboratory) or of a reputable manufacturer. New methods of analysis should be embraced and standardised as they appear.

(d) *Interpretation of results*.—The interpretation of results should be discussed from the point of view of application to the determination in question especially where standards of composition are involved. It is suggested that here this phase of standardisation is perhaps the most important, as the results obtained by analytical processes have to be considered in the light of the standards of composition already, or to be set. The interpretation of a series of analyses, taken together, for one foodstuff (e.g., a fat) would also come under discussion. The method of reporting analytical results, and deductions from them will also have to be considered.

56. To bring about the standardisation of the methods of analysis of foodstuffs in the different Provinces will require time. In addition, the highly technical character of this question will require that it should be considered fully by an expert body such as the proposed Central Committee for Food Standards. The importance of standardisation, constitutes a further argument for the early establishment of that Committee, so that Provinces may be advised without delay regarding what is required to bring their methods of analysis into line with modern practice.

(Sd.) E. COTTER (*Chairman*).

„ P. N. SAPRU.

„ LAKSHMI KANTA MAITRA.

„ C. M. NICOL.

„ J. M. ATKINSON.

„ A. K. SEN.

„ B. M. GUPTA.

„ J. S. NERURKER.

„ W. L. DAVIES.

„ A. M. LIVINGSTONE

Simla, the 29th September. 1939.

SUMMARY OF THE REPORT.

(1) The Committee consider that the problem of food adulteration can be divided into three parts :

- (a) the technical aspect ;
- (b) the legislative aspect ; and
- (c) the administrative aspect.

This report deals with only the technical aspect of the problem. (Paragraphs 4 and 6).

(2) In India the notification of standards of purity in foodstuffs is the responsibility of Provincial Governments. Almost every Province has a Food Adulteration Act and standards of purity are prescribed for different articles of food. When a sample of food fails to conform to a prescribed standard, it is presumed, until the contrary is proved, that the sample is not genuine. In England the practice of fixing standards of purity is followed to a limited degree and applies only to milk, condensed and dried milk products, butter and margarine. For other articles of food, the Public Analyst in England is not bound rigidly by standards but is allowed to use his judgment, which he is expected to form in the light of the experience of a number of tests and taking into account certain local conditions. (Paragraphs 7 and 8).

(3) Uniformity of practice amongst public analysts in England is assured by the cooperation of the Government Laboratory, Ministry of Health and the Society of Public Analysts. In India Provincial standards have been fixed by individual Provincial Governments with but limited consultation with one another. The Committee consider that an effective method of coordination between the Provinces in regard to food standards is an urgent necessity. It is therefore recommended that immediate steps should be taken by the Government of India or by the Central Advisory Board of Health to set up a standing Central Committee which will act in an advisory capacity on the lines of the Society of Public Analysts in England and the British Standards Institution. It might be called "The Indian Central Committee for Food Standards." It should include representatives of dairying and agricultural research, public analysts and other persons experienced in food analysis. A committee of about seven members is regarded as adequate. (Paragraphs 8, 9 and 12).

(4) An early task of this Committee would be the preparation of a set of 'Instructions for Public Analysts', these instructions being modified and supplemented from time to time in the light of new knowledge. (Paragraph 13).

(5) Much more information is required in regard to the variations in analytical results which occur throughout India in regard to genuine articles of food. These variations arise from a variety of conditions, such as, climate, breed of animal, methods of feeding, methods of cultivation and methods of manufacture, etc. (Paragraph 14).

(6) The percentage of adulteration of articles of food sampled in India in 1937 was 26.7 compared to a corresponding figure in England of about 5 per cent. (Paragraphs 15 and 16).

(7) In regard to the fat content of cow and buffalo milk, the Committee consider that it is not advisable to recommend an all-India figure. It should be left to the Provinces to decide the figure for themselves. In arriving at this conclusion the Committee took into consideration the fact that practically no inter-provincial trade in liquid milk exists and that the formulation of a common all-India standard is not therefore imperative. (Paragraph 20).

(8) The Committee consider that it is not desirable to prescribe a separate intermediate standard for mixed milk, largely on account of its varying composition depending upon the proportion of cow and buffalo milk present in the mixture. The Committee recommend that the practice of the Madras Government should be followed. In the Madras rules it is stated "where milk is sold without any indication as to whether it is derived from cow or buffalo, the standard of cow milk shall apply". (Paragraph 23).

(9) The Committee recommend a suitable definition for milk. (Paragraph 24).

(10) Inter-provincial trade in ghee exists on a large scale and the variations between provincial standards have reacted unfavourably on the free flow of trade in this commodity while the new Agmark standard has added a further complication. An essential step towards relieving the situation is an agreement between the Provinces as to what will be accepted as genuine ghee. (Paragraph 25).

(11) The formulation of a uniform standard for ghee applicable all over the country presents certain difficulties, since the agricultural marketing authorities assert that genuine samples of ghee from certain parts of India give analytical results which are markedly different from those obtained with samples from Northern India generally. (Paragraph 27).

(12) The Committee came to the conclusion that the values in respect of ghee should not be regarded as arbitrary figures which of themselves decide whether a sample is adulterated. There is an interdependence between the values resulting from different tests. In arriving at

his conclusions regarding a sample, an analyst should bear this in mind and, except of course in a flagrant case of adulteration, be guided by the general picture presented by the results of his various tests. The proposed Central Committee for Food Standards can exercise a strong influence towards evolving ~~truer~~ criteria of analysis by making available to public analysts new knowledge regarding methods of analysis, and by formulating fresh methods in order to meet new situations as they arise. (Paragraph 29).

(13) For administrative purposes, a single standard for all classes of ghee would facilitate smooth inter-provincial trade. The Committee, however, consider that to fix a single standard for the three classes of ghee (cow, buffalo and mixed) will leave a loophole for adulteration to the prejudice of the consumer. Separate working standards are therefore recommended. (Paragraph 30).

(14) In regard to the special areas in which according to the marketing authorities genuine samples of ghee give values markedly different from the figures recommended in this report, the Committee consider that the Central Committee for Food Standards should as soon as possible advise on appropriate standards for such ghee. Special arrangements will be required for marking or labelling and for avoiding any chance of substitution or adulteration of such ghee at the place of production. (Paragraph 34).

(15) The Committee recommend a definition for ghec. (Paragraph 35).

(16) The ordinary mustard oil on the market is obtained from the mixed seeds of a group of allied plants, the identification of which is not free from confusion. The oils obtained from the seeds of these different plants yield different values for certain of the prescribed tests. The Committee recommend standards for mustard oil, but consider that, as in the case of ghee, these standards should serve only as guide to public analysts and not as rigid values which would of themselves determine the purity of the samples under examination. (Paragraphs 37 and 38).

(17) In regard to other edible oils the Committee recommend standards which they consider would be suitable guides for all-India purposes. Definitions for the different oils are also recommended. (Paragraph 40).

(18) In regard to butter, the Committee recommend that the standards for butter fat prescribed as a guide in the case of ghee should apply. In regard to moisture content, the Committee agreed that the all-India standard should be 16, which is a statutory standard and not a guide. In the Provinces of Madras, Bengal and Assam the authorities, while possibly retaining 20 per cent. as the figure for maximum moisture content for home-made (*deshi*) butter should consider the advisability of having 16 per cent. at any rate for butter not manufactured in the usual indigenous way. (Paragraph 41).

(19) The Committee recommend a definition for butter. (Paragraph 42).

(20) The Committee recommend standards for other milk products. (Paragraph 43).

(21) In the case of tea, the Committee consider that standards should only form a guide to the public analyst in forming his judgment regarding adulteration. Even when a sample conforms to these standards, the presence of foreign leaves in the sample will condemn it as adulterated. (Paragraph 44).

(22) The Indian Tea Market Expansion Board have suggested the raising of tea standards in the various Provinces to those prescribed by the Government of Assam, and this would form a suitable subject for early enquiry by the proposed Central Committee for Food Standards. (Paragraph 45).

(23) Standards for coffee have been suggested by the Agricultural Marketing Adviser to the Government of India. The proposed Central Committee for Food Standards should make an early study of these suggestions and of the provincial standards with a view to recommending a common definition and standard for India. (Paragraph 47).

(24) The Committee recommend suitable definitions and standards for *mnida* and *atta*. (Paragraphs 48 and 49).

(25) The Committee recommend a suitable definition for edible hydrogenated vegetable oil (*vanaspati*). (Paragraph 51).

(26) The Committee consider that the question of colouring edible hydrogenated vegetable oil (*vanaspati*) requires careful study and is a suitable subject for investigation by the Central Committee for Food Standards. (Paragraph 52).

(27) The Committee wish to stress the importance of standardising the methods of food analysis in India. Most of these methods are already standardised and it remains to introduce them officially into Indian practice. (Paragraph 53).

(28) For individual analysts to obtain the same results in an empirical process of analysis, they must work to a standard technique with standardised apparatus. (Paragraph 54).

(29) Standardisation embraces the operations of (a) sampling, (b) treatment of sample, (c) the processes of analyses, and (d) the interpretation of results. These are discussed briefly. (Paragraph 55).

(30) The importance of standardisation constitutes a further argument for the early establishment of the Central Committee for Food Standards, so that Provinces may be advised regarding what is required to bring their methods of analysis into line with modern practice. (Paragraph 56).

APPENDIX I.

Existing standards prescribed for Milk (cow).

Prescribing authority.	Minimum percentage of milk fat.	Minimum Percentage of milk solids, not fat.	Specific gravity.	Minimum percentage of lactose.	Minimum percentage of nitrogen.
N. W. P. Government	3.5	8.0	....	..	..
Punjab Government	3.5	8.5	....	..	..
U. P. Government	3.5	8.5	1028—1030 at 15.5°C ..	4.0	..
Bihar Government	3.5	8.5	....	..	..
Bengal Government	3.5	8.5	1028—1030 at 15.5°C ..	4.4	..
Assam Government	3.5	8.5	Not less than 1028 at 15.5°C...	..	..
C. P. Government	3.0	8.5	....	..	..
Madras* Government	3.0	8.5	....	..	0.5
Bombay Government	3.5	8.5	....	..	..
Sind Government	3.5	8.5	....	4.4	..

*The Madras Government has further prescribed for cow milk (whole, separated or skimmed) a maximum limit for dirt (both milk and sediment being measured by volume) of five parts per 100,000 on standing for a period of 24 hours or less.

Existing standards prescribed for Milk (buffalo).

Prescribing authority.	Minimum percentage of milk fat.	Minimum percentage of milk solids, not fat.	Specific gravity.	Minimum percentage of lactose.	Minimum percentage of nitrogen
N.-W. F. P. Government	5.0	9.0	....	..	..
Punjab Government	5.0	9.0	....	..	..
U. P. Government	5.0	9.0	1028—1030 at 15.5°C ..	4.0	..
Bihar Government	6.0	9.0	....	..	..
Bengal Government	6.0	9.0	1028—1030 at 15.5°C ..	4.4	..
Assam Government	6.0	9.0	Not less than 1028 at 15.5°C...	..	..
C. P. Government	5.0	8.5	....	..	..
Madras* Government	4.5	9.0	....	..	0.53
Bombay Government	6.0	9.0	....	..	..
Sind Government	6.0	9.0	....	4.4	..

*The Madras Government has further prescribed for Buffalo milk (whole, separated or skimmed) a maximum limit for dirt (both milk and sediment being measured by volume) of five parts per 100,000 on standing for a period of 24 hours or less.

Existing standards prescribed for Mixed Milk (cow and buffalo).

Prescribing authority.	Minimum percentage of milk fat.	Minimum percentage of milk solids, not fat.	Specific gravity.	Minimum percentage of lactose.	Minimum percentage of nitrogen.
N.-W. F. P. Government	3.5	..	....	4.0	..
Punjab Government	3.5	8.6—9.0	....	..	..
U. P. Government .. ..	..	8.6—9.0	....	4.0	..
Bihar Government	5.0	9.0	....	4.0	..
C. P. Government	3.5	..	....	4.0	..
Madras Government .. ..	..	..	..	..	..

Where milk is sold without any indication as to whether it is derived from the cow or buffalo, the standards for cow milk shall apply. No separate standards for mixed milk.

Existing standards prescribed for Ghee (cow).

Prescribing authority.	Maximum percentage of moisture content.	Butter Fat.			Remarks.
		Butyro-refractometer reading at 40°C.	Saponification value.	Reichert value.	
N.W. F. P. Government ..	..	40-42.5	..	Between 24 and 32.	Not more than 2.8% of free fatty acid calculated as oleic acid.
Punjab Government ..	..	40-42.5	..	Not less than 24	Not more than 2.8% of free fatty acid calculated as oleic acid.
U. P. Government ..	1 p. c.	48-51 (at 25°C.).	Not less than 220	Not less than 24.	
Bihar Government ..	.. //	40-43	..	Not less than 24.	
Bengal Government ..	..	40-42.5	Not less than 220	Not less than 24.	
Assam Government ..	..	40-42.5	Not less than 222	Not less than 24.	
C. P. Government ..	..	40-46	..	19-36	
Madras Government ..	1 p. c.	..	..	..
Bombay Government ..	1 p. c.	40-44.5	..	Not less than 24.	
Sind Government ..	1 p. c.	40-42.5	Not less than 220	Not less than 24	
Central Government (Agmark)	0.5 p. c.	40.5-42.5	222-226	26-28	Polenske values not higher than those corresponding to the Reichert values in the following table :— Reichert value .. 30 29 28 27 26 25 24 Polenske value .. 3.5 3.4 3.2 2.9 2.5 2.3 2.2 Polenske value, 1.5-2.5. Kirschner value, 20-25. Not more than 1.5% of free fatty acids, calculated as oleic acid.

Proposed army standard—

- (i) The ghee shall be bleached from genuine clarified butter fat derived solely from the milk of buffaloes and cows.
(ii) The ghee shall be well clarified, sound and unadulterated, clean and of pleasant taste, smell and appearance.
(iii) The ghee shall conform to the following standards :—

Reichert value .....	..	..	..	..	..
Polenske value .....	..	..	..	..	..
Butyro-refractometer reading at 40°C ..	..	..	..	..	..
Proportion of free fatty acids in terms of oleic acid ..	..	..	..	..	..
					Not more than 3.1 per cent.

Existing standards prescribed for Ghee (buffalo).

Prescribing authority.	Maximum percentage of moisture content.	Butter Fat.			Remarks.
		Butyro-refractometer reading at 40°C.	Saponification value.	Reichert value.	
U. P. Government	Not more than 1 p. c.	48—51 (at 25°C.).	Not less than 220	Not less than 30	
Bihar Government	..	40—43	..	Not less than 30	
Bengal Government	..	40—42.5	Not less than 222	Not less than 30	
Assam Government	..	40—42.5	Not less than 224	Not less than 30	
Sind Government ..	Not more than 1 p. c.	40—42.5	Not less than 222	Not less than 30	Polenske values not more than those shown against Reichert values for cow ghee.
Central Government (Agmark)	Not more than 0.5 p. c.	40.5—42.5	226—234	Not less than 30	Polenske value 1.0—1.75. Kirschner value not less than 25. Not more than 1.5% of free fatty acids, calculated as oleic acid.

Existing standards prescribed for Mixed Ghee (cow and buffalo).

Prescribing authority.	Maximum percentage of moisture content.	Butter Fat.			Remarks.
		Butyro-refractometer reading at 40°C.	Saponification value.	Reichert value.	
U. P. Government	1 p. c.	48—51 (at 25°C.).	Not less than 220.	Not less than 28	
Bihar Government	..	40—43	..	Not less than 28	
Bengal Government	..	40—42·5	Not less than 222.	Not less than 28	
Assam Government	..	40—42·5	Not less than 224.	Not less than 28	
Sind Government	1 p. o.	40—42·5	Not less than 220.	Not less than 28	Polenske value not higher than that shown against Reichert value for cow ghee.
Central Government (Agmark) (special quality).	0·5 p. o.	40·5—42·5	222—234	Not less than 28	Polenske value 1·0—2·0. Percentage of free fatty acids calculated as oleic acid, not more than 2·5.

Existing standards prescribed for Butter.

Prescribing authority.	Maximum percentage of moisture content.	Butter Fat.			Remarks.
		Butyro-refractometer reading at 40°C.	Saponification value.	Reichert value.	
N.-W. F. P. Government ..	16	..	..	..	Must be made exclusively from the milk of cows or buffaloes ; not less than 80% of the butter must be milk fat.
Punjab Government ..	16	..	..	..	Must be made exclusively from the milk of cows or buffaloes ; not less than 80% of the butter must be milk fat.
U. P. Government <i>Cow</i> ..	16	48—51 at 25°C.	Not less than 220	Not less than 24	Made exclusively from milk or cream or both, with or without addition of salt and with or without the addition of vegetable colouring matter.
<i>Buffalo</i> ..	16	48—51 at 25°C.	Not less than 220	Not less than 30	
<i>Mixed</i> ..	16	48—51 at 25°C.	Not less than 220	Not less than 28	
Bihar Government ..	16	40—42			Boric acid or borax, used as preservative for butter, shall not be added in a greater proportion than 0.5 per cent.
Bengal Government ..	20	..	..	..	Must be made exclusively from milk or cream (other than condensed or desiccated milk or cream) or both with or without the addition of (vegetable) colouring matter.
Assam Government <i>Cow</i> ..	20	..	Not less than 222	Not less than 24	Must be exclusively derived from milk or cream (other than condensed, sterilised or desiccated milk or cream) or both, with or without salt or other preservative, and with or without the addition of colouring matter, being of such a nature and in such quantity as not to render the article injurious to health.
<i>Buffalo</i> ..	20	..	Not less than 224	Not less than 30	
<i>Mixed</i> ..	20	..	Not less than 224	Not less than 28	

Existing standards prescribed for Butter.

Prescribing authority.	Maximum moisture content.	Butter Fat.			Remarks.
		Butyro-refractometer reading at 40°C.	Saponification value.	Reichert value.	
C. P. Government ..	16	40—46	..	19—36	
Madras Government ..	20	..	..	..	Must be prepared exclusively from milk or cream or both, with or without the addition of salt or other innocuous preservative or of innocuous colouring matter.
Bombay Government ..	16	..	..	..	Must be prepared exclusively from milk or cream of the cow or buffalo or both, with or without the addition of common salt.
Sind Government ..	16	..	..	..	Must be made exclusively from milk or cream (other than condensed or desiccated milk or cream) or both, with or without salt and with or without the addition of vegetable colouring matter. It should contain not less than 80 per cent. of milk fat.

Existing standards prescribed for Condensed Milk.

Prescribing authority.		Minimum percentage of fat.	Minimum percentage of milk solids including fat.
Punjab Government ..	..	..	31.0
..	1. Condensed milk, full cream, sweetened	..	31.0
..	2. Condensed milk, full cream, unsweetened	..	26.0
..	3. Condensed milk, skimmed, sweetened ..	..	20.0
..	4. Condensed milk, skimmed, unsweetened	..	31.0
Bombay Government ..	Condensed milk.	9.0	..
Sind Government ..	The same standards as those of the Punjab	..	..
United Provinces ..	The same standards as those of the Punjab	..	..

Existing standards prescribed for Skimmed Milk.

<i>Prescribing authority.</i>							<i>Minimum percentage of milk solids other than milk fat.</i>
U. P.	Government	..	..	..	..	..	8.7
C. P.	"	..	..	..	..	..	8.5
Bombay	"	..	..	..	..	..	8.7
Sind	"	..	..	..	..	..	8.7

Existing standards prescribed for Dried Milk.

<i>Prescribing authority.</i>							<i>Minimum percentage of milk fat.</i>
Bombay	Government	..	Dried Milk.				26.0
Sind	"	..	1. Dried milk, full cream	..	..		26.0
			2. Dried Milk, three quarter cream	..			20.0
			3. Dried milk, half cream	..	..		14.0
			4. Dried milk, one quarter cream	..			8.0

Existing standards prescribed for Butter-milk.

<i>Prescribing authority.</i>							<i>Minimum percentage of milk solids other than milk fat.</i>
U. P.	Government	..	..	..	..	..	8.7
Sind	"	..	..	..	..	..	8.0
C. P.	"	..	..	..	..	..	8.5

Existing standards prescribed for Dahi.

<i>Prescribing authority.</i>							<i>Minimum percentage of milk fat from</i>	
							<i>Cow milk.</i>	<i>Buffalo milk.</i>
U. P.	Government	..	..	..			3.5	3.5
Bengal	"	..	..	..			3.5	6.0
C. P.	"	..	..	..			3.0	5.0
Bombay	"	..	..	..			3.5	6.0
Sind	"	..	..	..			3.5	6.0

Existing standards prescribed for Khoa.

<i>Prescribing authority.</i>		<i>Definition.</i>	<i>Maximum percentage of moisture.</i>	<i>Minimum percentage of milk fat.</i>
N.-W. F. P.	Government	Milk derived from cows or buffaloes, the moisture from which has been partially removed by heat.	10.0	20.0
Punjab	"	Ditto.	10.0	20.0
U. P.	"	Pure desiccated milk of cow or buffalo; must be derived from milk and shall not contain any ingredient not found in milk.	..	15.0
C. P.	"	Partially desiccated milk of a soft puttylike consistency; should not contain any matter not exclusively derived from milk.	10.0	20.0

Existing standards prescribed for Channa.

<i>Prescribing authority.</i>		<i>Description.</i>	<i>Minimum percentage of milk fat.</i>
Bengal	Government	.. The product obtained by precipitating curd from boiling milk by the addition of lactic acid.	10.0

Existing standards prescribed for Mustard Oil.

Prescribing authority.	Butyro-refractometer reading at 40°C.	Saponification value.	Iodine value.	Description.
U. P. Government	..	169—176	96—108	The fixed oil expressed or extracted from mustard seed.
Bihar Government	..	169—176	96—108	
Bengal .. ..	..	169—175	96—104	The fixed oil expressed or extracted from mustard seed.
Assam	58—60	169—176	96—104	..
Sind .. ..	..	169—175	96—104	..
Punjab Government—				
1. Mustard oil	..	169—175	96—104	The oil extracted exclusively from the seeds of <i>Brassica Juncea</i> (Rai).
2. Sarson oil ..	} ..	170—180	93—105	The dark brown viscous oil obtained exclusively from the seeds of <i>Brassica Rapa</i> .
3. Toria oil ..				The dark brown viscous oil obtained exclusively from the seeds of <i>Brassica Napus</i> .
4. Taramira oil				The dark brown viscous oil obtained exclusively from the seeds of <i>Eruca Sativa</i> .
C. P. Government ..	58.9—59.5	169—176	96—108	..

Proposed Agmark Standards for Mustard Oil.

Physical and chemical characteristics									
Grade designations.	Colour.	Refractive Index at 40°C.	Specific Gravity at 30°/30°C.	Unsaponifiable matter.	Acid value.	Saponification value.	Iodine value (Wij's method).	Natural essential oil.	Description and appearance.
1	2	3	4	5	6	7	8	9	10
Special	Not lighter than equivalent to a combination of 3 red and 50 yellow units on a Lovibond colour scale, when measured through a one inch cell.	1.4646 to 1.4666	.905 to .908	Not more than 1 per cent.	Not more than 2.	170 to 175	99 to 104	0.5% to 0.75%	Description :— Mustard oil (edible) shall be the fixed oil obtained by a process of expression (not extraction) of mustard, Sarson seed (<i>Brassica Campestris</i>) or of commercial mixtures of mustard seed with other oil-seeds such as <i>rape, toria, lathi, rai</i> or <i>laha</i> belonging to <i>Juncea, Napus</i> and <i>Rapa</i> varieties of Brassica.
Grade A	Not lighter than equivalent to a combination of 3 red and 50 yellow units on a Lovibond colour scale, when measured through a one inch cell.	1.4643 to 1.4669	.905 to .909	Not more than 1.5 per cent.	Not more than 4.	170 to 178	98 to 108	Not less than 0.4%	<i>Niger seed (Guzotia Abyssinica)</i> may be present to the extent of 2 per cent. to facilitate the expression of oil. Mustard oil shall be free from added flavouring and colouring substances* or admixture with any mineral, essential, or extracted oil or other fixed oils.
									Appearance :— Mustard oil (edible) shall be clear† free from sediment and other insoluble matter.

Proposed Agmark Standards for Til or Gingelly (Sesame) Oil.

Physical and chemical characteristics.									
Grade designations.	Colour.	Refining.	Refractive Index	Specific Gravity at	Unsaturation	Acid	Saponification	Iodine	Description and appearance.
			at 40°C.	15.5°/15.5°C.	table matter.	value.	value.	value (Wij's method).	
1	2	3	4	5	6	7	8	9	10
Special	Not deeper than equivalent to a combination of 1.5 red and 20 yellow units on the Lovibond colour scale when measured through a one inch cell.	The oil may be refined but no chemical bleaching agents shall be used.	1.4646 to 1.4666	.921 to .924	Not more than 1.3 per cent.	Not more than 3.	188 to 193	105 to 114	<i>Description:—</i> Til or Gingelly (sesame) oil (edible) shall be the oil obtained by a process of expression (not extraction) from til or gingelly (sesame) seed (black, brown, white or mixed) and shall be free from admixture with other oils or any other substances. The oil may be refined but no chemical bleaching agents shall be used. <i>Appearance:—</i>
Grade A	Not deeper than equivalent to a combination of 2.5 red and 30 yellow units on the Lovibond colour scale when measured through a one inch cell.	The oil may be refined but no chemical bleaching agents shall be used.	1.4640 to 1.4666	.921 to .924	Not more than 1.5 per cent.	Not more than 4.	188 to 193	105 to 114	Til or Gingelly (sesame) oil (edible) shall be clear,* free from sediment and other insoluble matter.

•A sample shall be considered clear if it does not show any turbidity by keeping at 20°C for 24 hours.

Edible (Vegetable) Oils.

Standards have been prescribed in certain provinces for the following edible oils.

Groundnut oil.

<i>Prescribing authority.</i>	<i>Butyro-refractometer reading at 40°C.</i>	<i>Saponification value.</i>	<i>Iodine value</i>
C. P. Government	55.0—57.5	189—195	92—101
U. P. Government	61.2—64.3*	189—195	92—101
Sind Government	55.0—56.0	189—195	92—101

Sesame oil (til oil or gingelly oil).

C. P. Government	59.0—60.5	188—193	104—115
U. P. Government	66.5*	188—193	104—115
Sind Government	58.2	188—193	104—115
Punjab Government .. ..	..	188—193	103—112

Cotton seed oil.

C. P. Government	58.0—59.0	190—195	110—116
U. P. Government .. ..	..	190—195	110—116
Sind Government .. ..	..	190—195	110—116

Olive oil.

C. P. Government	53.0—56.0	185—195	79—90
U. P. Government .. ..	..	185—196	79—90
Sind Government .. ..	..	185—196	79—90

Poppy seed oil.

U. P. Government	68.2—72.0*	186—194	133—143
Sind Government	69.64	186—194	133—143

Cocoanut oil.

C. P. Government	34.5—35.5	255—260	8—9
U. P. Government .. ..	..	255—260	8—9
Sind Government	250—260	8—9

Linseed Oil.

C. P. Government	71.5—79.0	189—195	175—200
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Safflower oil.

U. P. Government	70.6—72.9*	185.5—186.0	135.2—135.6
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*Butyro-refractometer reading taken at 25°C.

Existing standards prescribed for Wheat Flour (Maida and Atta).

32

Prescribing authority.	Maximum percentage of ash calculated on the dried substance.		Minimum percentage of gluten.		Maximum percentage of moisture.	Remarks.
	Maida.	Atta.	Maida.	Atta.		
N.-W. F. P. Government ..	..	..	8.0 of dry gluten and 8.0 of protein (nitrogen $\times 5.7$).	8.0	13.0	Should be derived exclusively from wheat.
Punjab Government ..	..	2.0	8.0 of dry gluten and 8.0 of protein (nitrogen $\times 5.7$).	8.0	13.0	
U. P. Government ..	1.0	2.5	8.0	8.0	..	
Bengal Government ..	1.0	2.5	..	..	..
Assam Government ..	1.0	2.0	8.0	8.0	..	Foreign starch shall be nil.
G. P. Government ..	1.0	2.5	8.0	8.0	..	Both maida and atta must be exclusively derived from wheat and should contain no admixture with pulverised products of other grains. Crude fibre should not exceed 3 per cent.
Bombay Government ..	1.0	2.5	8.0	8.0	..	The presence of alum is prohibited. Crude fibre should not exceed 3 per cent.
Sind Government ..	1.0	2.5	8.0	8.0	..	Bleaching by artificial means is prohibited as well as the presence of alum or other added chemical substances.

Existing standards prescribed for Tea.

Prescribing authority.	Percentage of total ash determined on tea dried to a constant weight at 100°C.	Minimum percentage of total ash soluble in boiling distilled water.	Minimum percentage for the extract obtained by boiling one part of dry tea (tea dried to constant weight at 100°C.) with 100 parts by weight of distilled water for one hour.	Maximum percentage of moisture determined at 100°C.	Maximum percentage of ash insoluble in dilute mineral acid.
N.-W. F. P. Government	4.0—8.0	30.0	..
Punjab Government	4.0—8.0	30.0	..
U. P. Government	4.0—8.0	30.0	..
Bihar Government	4.0—8.0	30.0	..
Bengal Government	4.0—8.0	30.0	..
Assam Government	4.0—8.0	35.0	1.0
Central Provinces Government	4.0—8.0	30.0	..
Madras Government	4.0—8.0	..	1.0
Bombay Government	4.0—8.0	30.0	1.0
Sind Government	4.0—8.0	30.0	..

Foot-note.—The tea leaves should conform in structure to those of the *Camellia* genus and of species *Thea sinensis* L.

Existing standards prescribed for Coffee.

34

Prescribing authority.	....	Description.	Remarks.
Punjab Government ..	(a) Coffee ..	The seed of cultivated varieties of Coffee Arabica, Coffee Liberica and Coffee Robusta.	The seed must have the characteristic appearance under the microscope.
	(b) Green coffee, raw coffee, unroasted coffee.	Coffee seed freed from all but a small portion of its spermoderm and conforming in variety and in place of production to the same it bears.	Ditto.
	(c) Roasted coffee "Coffee".	Properly cleaned green coffee seed which by the action of heat (roasting) has become brown and has developed its characteristic aroma.	Ditto.
	(d) French coffee, table coffee or coffee mixed with chicory.	Mixture of coffee seed with chicory. The percentage of chicory shall not exceed 50.	..
Bombay Government	(a) Coffee (b) Roasted coffee (c) Ground coffee	Means the seeds of Coffee Arabica or Coffee Liberica. Means the roasted seeds of coffee. Means exclusively the roasted seeds of coffee, crushed or ground or otherwise prepared so as to be suitable for making an infusion or decoction.	
Sind Government ..		Other standards prescribed are that coffee or ground coffee should not contain any foreign substance and that the maximum percentage of ash is 5 per cent. 70 per cent. of the ash being water soluble and only a trace insoluble in acid. Coffee should yield an extract, in boiling water, between 21.5 and 26.5 per cent. Coffee should not contain starch. The descriptions for coffee under the subheadings (a) and (b) are the same as those given by the Punjab Government. For the third subheading, 'Roasted coffee', in addition to the definition given for this substance by the Punjab Government, it has been stated that the admixture of other substances is prohibited, except chicory in a proportion not exceeding 50 per cent., the fact of such an addition and the exact proportion being clearly indicated on the label on the container or packet.	
Assam Government ..		Other standards prescribed are similar to those given in respect of Bombay Government. As in the Punjab.	

Vanaspati.

'Vanaspati' has been defined by the Bombay Government as any article of food resembling ghee which consists of refined hydrogenated edible vegetable oils and not more than 20 per cent. of milk fat.

On the other hand, the Government of Sind has defined 'Vanaspati' as any article of food resembling ghee and consisting of hydrogenated edible vegetable oils but which is entirely free from ghee, butter fat or any product derived from milk or other animal fat.

Standards prescribed for Vanaspati.

Bombay Government.

1. The maximum acidity for 'Vanaspati' when not mixed with milk fat is 0.25 per cent. calculated as oleic acid.
2. The maximum acidity for 'Vanaspati' when mixed with milk fat is 0.50 calculated as oleic acid.

Sind Government.

The maximum acidity prescribed is 0.25 per cent. calculated as oleic acid.

Existing standards prescribed for Malt Vinegar.

Malt vinegar, when constituted as shown hereunder, shall be presumed to be not of the nature substance or quality it purports to be:—

Punjab.

- (1) when it contains any mineral acids or other metallic impurities,
- (2) when it contains solids less than 2 grms. in 100 c.c., ash less than 0.2 grms. in 100 c.c., acetic acid less than 4 grms. in 100 c.c., phosphoric acid (P_2O_5) less than 5 grms. per 100 c.c.

Sind.

- (1) when it contains any mineral acid or colouring matter other than caramel,
- (2) when it contains less than 4 grms. of acetic acid per 100 c.c. or arsenic in amounts exceeding 0.0143 milligrammes in 100 c.c. or when it contains less than 1.5 per cent. of total solids or less than 0.05 per cent. of P_2O_5 and 0.01 per cent. of nitrogen.

Existing standards prescribed for vinegar.

Province.	Definition.	Standard.
Bombay .. ..	.. ..	Vinegar, which contains less than 4 grms. of acetic acid ($C_2H_4O_2$) or arsenic in amounts exceeding 0.0143 milligrammes in 100 c.c. of vinegar, any sulphuric acid or other mineral acids, lead, copper or any other foreign substance, or colouring matter except caramel, shall be deemed to be not of the nature, substance or quality of vinegar.
Sind .. ..	.. A liquid derived wholly from alcoholic and subsequent acetous fermentation.	Vinegar which contains less than 4 grms. of acid ($C_2H_4O_2$) per 100 c.c. of vinegar or arsenic in amounts exceeding 0.0143 milligrammes in 100 c.c. of vinegar or less than 1.5 per cent. of total solids or less than 0.18 per cent. of mineral matter or which contains any mineral acid or lead or copper, or colouring matter other than caramel, shall be presumed to be not of the nature, substance or quality of vinegar.

APPENDIX II.

Results of the Ghee Analyses carried out by B. L. Khuller, Esq., M.Sc., A.I.C.,

Public Health Chemist, Punjab.

Preliminary statement pending further data becoming available.

Buffalo.																					
District.	Butyro-Ref. value.					Reichert Value.							Polenske.								
	No. of samples.	Average.	Lowest.	Highest.	Percentage of samples.				Average.	Lowest.	Highest.	Percentage of samples.									
					Between 10—12.5.	13.0—13.	13.1—13.5.	Above 13.5.				Below 24.	24—25.	25—1—27.	27—1—30.	30—1—34.	34—1—36.	Over 36.			
..	30	42.2	40.5	44.0	68	10	11	2	32.72	25.2	40.81	..	..	3	10	50	11	20	1.72	1.1	2.0
Shahpur (January) ..	..	..	..	..	53	13	14	12	31.0	23.0	38.91	6	5	7	23	40	14	7	1.66	0.8	3.2
Gujrat (February) ..	..	..	..	..	17	21	17	44	26.52	18.4	36.5	25	7	25	20	17	3	2	1.07	0.5	2.4
Ferozepore (February)	..	..	..	..	18	15	15	22	30.58	16.94	39.2	9	2	7	20	37	11	9	1.15	0.6	2.0
Montgomery (April) ..	..	..	..	..	16	10	10	52	26.02	16.04	35.04	18	8	26	30	12.	6	0	0.9	0.4	2.2
Lyalpur (June) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total	232	43.48	41.2	46.2	16	10	10	52	26.02	16.04	35.04	18	8	26	30	12.	6	0	0.9	0.4	2.2

Existing Punjab Standards for :-

Buffalo.
D. R. .. 40-42.5 R. W. not less than 24.

Standards suggested by the Committee.

D. R. Buffalo.

R. W. 40.5-43.5

.. .. Not less than 30.

Note.--All samples analysed were genuine ghee. The Chemist saw the animals milked, took the milk into his custody until the fat had separated and saw the fat removed and the ghee made.

The samples were taken during the months noted.

The diet of the animals was mixed, consisting of various combinations of green fodder, turnips, dry wheat, gram, etc.

Cotton seed and sarson seed cake entered into the diets of approximately 80% of the animals.

The 50 Lyalpur animals were in June getting a negligible quantity of green fodder and were fed mainly on wheat straw, cotton seed and sarson seed cake.

**Results of Ghee Analyses carried out by B. L. Khuller, Esq., M.Sc., A.I.C.,
Public Health Chemist, Punjab.**

Preliminary statement pending further data becoming available.

District.	Cow.														Mixed.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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Shahpur (January)	..	42.6	41.0	43.0	66	..	34	..	28.31	26.67	30.7	33	33	33

Existing Punjab standards for :

Buffalo. Cow and Mixed.

B. R. .. 40—42.5 R. W. .. Not less than 24.

Standards suggested by the Committee.

Cow. Mixed.

B. R. 40.5—42.5 40.5—42.5.

Not less than 24.

R. W. .. 38—38. Not less than 28.

M341PHO—1000—23.10—40—GIPS

Note.—All samples analysed were genuine ghee. The Chemist saw the animals milked, took the milk into his custody until the fat had separated and saw the fat removed and the ghee made.
The samples were taken during the months noted.

The diet of the animals was mixed consisting of various combinations of green fodder, turnips, dry wheat, gram, etc. Cotton seed and sarson seed cake entered into the diets of approximately 80% of the animals.

